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SEMI-ANNUAL REPORT NO. 14

Grantee

New Mexico State University
University Park, New Mexico

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Title

CONTINUED PHOTOGRAPHIC PATROL AND STUDY OF THE PHYSICAL CONDITIONS OF THE MOON AND PLANETS

Grant NsG-142-61

Period
15 October 1967 to 14 April 1968

Clyde W. Tombaugh
Principal Investigator

1.0 Summary of Work

1.1 Photographic Observations

A total of 1306 plates was taken with the 24-inch Boller and Chivens telescope. Ten plates were taken with the 12-inch Fecker telescope.

1.1.1 Mercury

Thirty plates were taken in red light on 19 days in the vicinity of greatest elongations.

1.1.2 Venus

A total of 142 plates was taken on 43 days, 81 plates in ultraviolet light, 11 in blue, 16 in green, 16 in red light, and 18 plates through a polaroid.

1.1.3 Mars

A total of 94 plates was taken on 43 nights, one in ultraviolet light, 12 in blue, 36 in green, and 45 in red light. Several of the last were taken a year after opposition. To our knowledge, this is the most extended program of Mars plates in astronomical history.

1.1.4 Jupiter

A total of 963 plates was taken on 112 nights, in spite of the worst observing season in many years. Twenty-two plates were taken in ultraviolet light, 366 in blue, 259 in green, 310 in red, and 16 in infrared light.

1.1.5 Saturn

A total of 40 plates was taken on 16 nights, 3 in ultraviolet light, 9 in blue, 16 in green, and 12 in red light.

1.1.6 Moon

Six plates were taken of Saturn emerging from behind the moon during an occultation on November 13, 1967. The seeing was fairly good, and some of the pictures are quite impressive with Saturn appearing just above the moon's limb.

1.1.7 Uranus

One plate was taken of Uranus in green light.

1.1.8 Miscellaneous

Thirty test and calibration plates were taken on 22 nights.

1.2 Reduction of Data and Studies

1.2.1 Venus

Examination of differential polarization of ultraviolet light across the disk of Venus has failed to support a suggestion by Kuiper that UV cloud visibility might be explained by single scattering and selective absorption.

1.2.2 Mars

Positional measurements of features on both 1965 and 1967 plates were continued, with special attention given to better identification of grosser features present on the Mariner IV photographs obtained by the Jet Propulsion Laboratory.

Measurements were made of the extent of the south polar cap during September and October, 1967, in view of their importance to the extent to be expected during the next Mariner experiments in the same season in 1969.

The compilation of cloud data and "blue clearing" occurrences on the 1965 plates was begun.

1.2.3 Jupiter

Reese made 1060 measurements for the longitude of 24 selected features, and 440 measurements for the latitude of the Jovian belts and 17 selected features. A very dark streak which persisted in the South Temperate Belt from 8 November through 15 March was given special attention. A highlight of the 1967-1968 apparition was the appearance of a small, dark spot on the south edge of the N. N. Temperate Belt at latitude $35\overset{\circ}{.}3$N. which had a rotation period of $9^h53^m51\overset{s}{.}$ This spot belonged to the rarely observed N. N. Temperate Current B.

Solberg made measurements of the Red Spot for longitude on 65 plates, and for latitude on 30 plates. He has been analyzing a 3-month oscillation of Red Spot longitude from 1963-1968 plates.

A total of 272 composites of original Jupiter plates has been sent to each of the International Planetary Plate Depositories, namely, Flagstaff, Arizona and Meudon, France.

2.0 Planetary Conferences and Visiting Scientists

2.1 Smith, B. A., "Motions of Ultraviolet Clouds on Venus", presented at Geological Sciences Seminar, CalTech; Pasadena on 20 Nov. 1967.

2.2 Smith, B. A., participated in three Mariner 69 Experimenters meetings at CalTech and JPL, (Feb.-March 1968).

2.3 Leighton, R., Baum, W., Jones, S., visited New Mexico State University Observatory in February and March for conferences on Mars with Haas, W., Robinson, J. C., Smith, B. A., and Tombaugh, C. W.

2.4 Smith, B. A., attended the Second Arizona Conference on Planetary Atmospheres in Tucson on March 10-13, 1968.

3.0 Publications

3.1 Reese, E. J., "An Old and a New Dark Streak on Jupiter", *Sky and Telescope,* **35** 258 (1968).

3.2 Reese, E. J. and Smith, B. A., "Evidence of Vorticity in the Great Red Spot of Jupiter", TN-701-68-16, New Mexico State University Observatory (1968).

3.3 Smith, B. A. and Reese, E. J., "Observations of Io at Inferior Geocentric Conjunction", TN-701-68-18, New Mexico State University Observatory.

3.4 Solberg, H. G., "Jupiter's Red Spot in 1965-1966", *Icarus*,**8**, 82-89, (1968).

3.5 Solberg, H. G., "Jupiter's Red Spot in 1966-1967". Accepted for publication in *Icarus*.

3.6 Solberg, H. G., "Jovian North Equatorial Belt Spots in 1966-1967" TN-701-68-15, New Mexico State University Observatory. Accepted for publication in *Planetary and Space Science*.

3.7 Tombaugh, C. W., "A Survey of Long-Term Observational Behavior of Various Martian Features that Affect Some Recently Proposed Interpretations" with 563 references. Accepted for publication in *Icarus*,**8** 227-258 (1968).

4.0 Personnel

4.1 Dr. C. W. Tombaugh has continued on half-time teaching status at New Mexico State University and as co-supervisor of the planetary research project.

4.2 Bradford A. Smith has continued as Director of the Observatory and co-supervisor of the planetary research project. He devotes half-time to this grant.

4.3 J. C. Robinson has continued full-time on the reduction and study of the Mars photographs.

4.4 C. F. Mozer has continued as assistant physicist, but on a half-time basis.

4.5 E. J. Reese re-joined the staff 1 May 1967 as data analyst.

4.6 T. C. Bruce has continued as computer programmer.

4.7 R. L. Fritz has continued as chief photographic techincian.

4.8 A. S. Murrell has continued as chief observer.

4.9 T. P. Pope has continued as full-time observer.

4.10 R. B. Minton has continued as full-time photographic technician.

4.11 T. B. Kirby, a graduate student in physics, continued as part-time assistant.

4.12 H. G. Solberg, an undergraduate student in physics, continued as part-time assistant.

5.0 Fiscal Status

The estimated balance remaining in the grant as of 31 March 1968 was $304.32 plus step funding for the next year in the amount of $120,000.00.